

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 25

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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Ex parte YUKIO TANAKA, AKIO TAKIMOTO, KOJI AKIYAMA,  
YASUNORI KURATOMI, JUNKO ASAYAMA and  
HISAHITO OGAWA

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Appeal No. 1999-0578  
Application 08/217,641

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ON BRIEF

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Before JERRY SMITH, GROSS and LEVY, Administrative Patent Judges.

JERRY SMITH, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on the appeal under 35 U.S.C. § 134 from the examiner's final rejection of claims 1-5, 8, 9, 14-26, 29 and 30. Claims 6, 7, 10-13, 27 and 28 were indicated to contain allowable subject matter in the final rejection. In response to the appeal brief, the examiner withdrew the rejection of claims 5, 9 and 14-26. Therefore, this appeal is

now directed to the rejection of claims 1-4, 8, 29 and 30.

The disclosed invention pertains to a spatial light modulator for a display device. More specifically, the disclosed invention is directed to a spatial light modulator which has a spatially uniform intermediate state between a stable fixed on state and a stable fixed off state.

Representative claim 1 is reproduced as follows:

1. A spatial light modulator including a pair of facing transparent electrodes, and a light-modulating layer and a photoconductive layer provided between said transparent electrodes,

wherein said light-modulating layer has different optical states depending on an applied charge amount, said light-modulating layer having: a first optical state when said applied charge amount is a first threshold charge amount or more; a second optical state when said applied charge amount is a second threshold charge amount of less; and a spatially uniform intermediate state between said first optical state and said second optical state depending on said applied charge amount.

The examiner relies on the following references:

Harwood et al. (Harwood)	4,888,599	Dec. 19, 1989
Hanyu et al. (Hanyu)	4,932,757	June 12, 1990
Hartmann	4,976,515	Dec. 11, 1990
Fukushima et al. (Fukushima)	5,130,830	July 14, 1992
Takimoto et al. (Takimoto 1)	5,364,668	Nov. 15, 1994
		(filed Jan. 03, 1992)
Takimoto et al. (Takimoto 2)	EP 0 494 452	July 15, 1992

Appeal No. 1999-0578  
Application 08/217,641

Wen Li et al. (Li), "Hydrogenated Amorphous-Silicon  
Photosensor for Optically Addressed High-Speed Spatial Light  
Modulator," IEEE Transactions on Electron Devices, Vol. 36,  
No. 12, December 1989, pages 2959-2964.

The following rejections are on appeal before us:

1. Claim 1 stands rejected under 35 U.S.C. § 102(b) as  
being anticipated by the disclosure of Fukushima.

2. Claims 2 and 3 stand rejected under 35 U.S.C. § 103  
as being unpatentable over the teachings of Fukushima in view  
of Takimoto 2.

3. Claim 4 stands rejected under 35 U.S.C. § 103 as  
being unpatentable over the teachings of Fukushima in view of  
Takimoto 2 and Hanyu.

4. Claims 8 and 29 stand rejected under 35 U.S.C. §  
103 as being unpatentable over the teachings of Takimoto 1 in  
view of Li and Harwood.

5. Claim 30 stands rejected under 35 U.S.C. § 103 as  
being unpatentable over the teachings of Hanyu in view of  
Hartmann.

Rather than repeat the arguments of appellants or the  
examiner, we make reference to the briefs and the answer for

the respective details thereof.

OPINION

We have carefully considered the subject matter on appeal, the rejections advanced by the examiner and the evidence of anticipation and obviousness relied upon by the examiner as support for the rejections. We have, likewise, reviewed and taken into consideration, in reaching our decision, the appellants' arguments set forth in the briefs along with the examiner's rationale in support of the rejections and arguments in rebuttal set forth in the examiner's answer.

It is our view, after consideration of the record before us, that the prior art evidence relied upon by the examiner is sufficient to support the rejection of claim 1. We reach the opposite conclusion with respect to claims 2-4, 8, 29 and 30. Accordingly, we affirm-in-part.

We consider first the rejection of claim 1 under 35 U.S.C. § 102(b) as being anticipated by the disclosure of Fukushima. Anticipation is established only when a single prior art reference discloses, expressly or under the principles of inherency, each and every element of a claimed

Appeal No. 1999-0578  
Application 08/217,641

invention as well as disclosing structure which is capable of performing the recited functional limitations. RCA Corp. v. Applied Digital Data Systems, Inc., 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir.); cert. dismissed, 468 U.S. 1228 (1984); W.L. Gore and Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1554, 220 USPQ 303, 313 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984).

The examiner has indicated how he reads the invention of claim 1 on the disclosure of Fukushima [answer, page 4]. Appellants argue that Fukushima does not disclose a spatially uniform intermediate state. Appellants argue that a spatially uniform intermediate state requires that the liquid crystal molecules attain a stable state in which the orientation of the molecules are all the same but not the same as one of the stable (ON and OFF) states [brief, pages 4-5]. Appellants note that Fukushima's intermediate state is not a stable state and therefore is not a spatially uniform intermediate state as claimed [id., page 7]. Appellants also argue that the intermediate state in Fukushima is not dependent upon the applied charge as claimed [id., page 9]. The examiner

responds that the liquid crystal molecules of Fukushima are in a spatially uniform intermediate state when the applied charge is less than a threshold value as evidenced by Figures 22(A)-(D). The examiner also notes that claim 1 does not require that the intermediate state be stable [answer, page 8]. The examiner also responds that the intermediate state in Fukushima is the result of the product of time multiplied by the applied voltage which is equal to charge. Appellants respond that the intermediate state in Fukushima is dictated by the timing of the read light and not by the amount of applied charge [reply brief, pages 2-3].

After a careful consideration of the record in this case, we will sustain the examiner's rejection of claim 1. In asserting how the phrase "spatially uniform intermediate state" should be interpreted, appellants argue that the state must be stable and the liquid crystal molecules in that state must all be in the same orientation which is different from the orientation of the molecules in the ON state and the OFF state. Although this argument is consistent with the disclosed invention, we agree with the examiner that during prosecution claims are to be given the broadest reasonable

interpretation. We have been unable to find the interpretation asserted by appellants to be specifically set forth anywhere in the disclosure. Therefore, the phrase should be given a conventional interpretation. Thus, we agree with the examiner that the phrase does not require that the intermediate state be stable as argued by appellants. In fact, none of the states recited in claim 1 is required to be stable. Appellants could always amend the claim so that it clearly requires the argued interpretation.

The liquid crystal molecules in Fukushima have one uniform orientation in the OFF state [Figure 22(A)] and a second uniform orientation in the ON state [Figure 22(C)]. When the charge applied in Fukushima is insufficient to hold the molecules in the ON state, they return to the OFF state. Thus, at any point in time during the intermediate state (that is a charge insufficient to hold the molecules in an ON state), all the molecules will have a uniform orientation which is between the orientations of the ON state and the OFF state as they return to the OFF state. Although the orientation of the molecules is constantly changing in Fukushima during the intermediate state, this constitutes a

plurality of spatially uniform intermediate states which is sufficient to meet the claim recitation of a spatially uniform intermediate state.

The fact that Fukushima controls the timing of the read signal to read the intermediate state at a selected orientation of the molecules is not relevant to the claimed invention. Claim 1 only requires that there exist a spatially uniform intermediate state between the ON and OFF states. This intermediate state exists in Fukushima whether or not a read signal is applied. The read signal in Fukushima simply selects one of the many spatially uniform intermediate states which exist in Fukushima.

Finally, we agree with the examiner that the intermediate states in Fukushima are determined by an applied charge amount. The intermediate state in Fukushima is a function of whether the product of the voltage and pulse width of a control pulse exceeds a threshold value. We agree with the examiner that this product results in the states in Fukushima depending on the applied charge amount as claimed.

Since we are not persuaded by any of appellants' arguments that the examiner's rejection of claim 1 is in



error, we sustain the rejection of claim 1.

We now consider the rejections of the claims under 35 U.S.C. § 103. In rejecting claims under 35 U.S.C. § 103, it is incumbent upon the examiner to establish a factual basis to support the legal conclusion of obviousness. See In re Fine, 837 F.2d 1071, 1073, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). In so doing, the examiner is expected to make the factual determinations set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to arrive at the claimed invention. Such reason must stem from some teaching, suggestion or implication in the prior art as a whole or knowledge generally available to one having ordinary skill in the art. Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir.), cert. denied, 488 U.S. 825 (1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986); ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). These showings by the

examiner are an essential part of complying with the burden of presenting a prima facie case of obviousness. Note In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). If that burden is met, the burden then shifts to the applicant to overcome the prima facie case with argument and/or evidence. Obviousness is then determined on the basis of the evidence as a whole and the relative persuasiveness of the arguments. See Id.; In re Hedges, 783 F.2d 1038, 1039, 228 USPQ 685, 686 (Fed. Cir. 1986); In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984); and In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147 (CCPA 1976). Only those arguments actually made by appellants have been considered in this decision. Arguments which appellants could have made but chose not to make in the brief have not been considered [see 37 CFR § 1.192(a)].

We consider first the rejection of claims 2 and 3 based on the teachings of Fukushima and Takimoto 2. The examiner cites Takimoto 2 as teaching a spatial light modulator in which a photoconductive layer has a rectification function [answer, page 5]. Appellants argue that combining

Takimoto 2 with Fukushima is improper because Takimoto 2 is concerned with avoiding intermediate states [brief, page 10]. The examiner responds that the rectification function of Takimoto 2 is only being used to improve the response time and light sensitivity in the photoconductive layer of Fukushima [answer, page 9]. Appellants respond that combining Takimoto 2 with Fukushima would introduce all the polarity problems that Fukushima is trying to avoid [reply brief, pages 3-4].

We agree with appellants for the reasons discussed in the appeal briefs. It is improper for the examiner to select only the rectification function of Takimoto 2 when the rest of the reference indicates it would be unsuitable for use with Fukushima. Therefore, we do not sustain the rejection of claims 2 and 3. Since claim 4 depends from claim 3, and since the additional citation of Hanyu does not overcome the deficiencies in the combination of Fukushima and Takimoto 2, we also do not sustain the examiner's rejection of claim 4.

We now consider the rejection of claims 8 and 29 based on the teachings of Takimoto 1, Li and Harwood. The examiner has indicated how he finds obviousness [answer, pages 6-7]. Appellants argue that Takimoto 1 teaches away from a spatially

uniform intermediate state and Harwood does not use its feedback control to maintain a writing light intensity to output light intensity ratio approximately constant as claimed [brief, pages 12-13]. The examiner responds that Takimoto 1 still has a spatially uniform intermediate state and Harwood suggests other modifications could be made to his device [answer, pages 10-11]. Appellants respond that maintaining the contrast ratio in Harwood is not the same and does not suggest keeping the ratio of writing light intensity to output light intensity approximately constant as claimed [reply brief, pages 4-5].

We agree with appellants for the reasons set forth in the briefs. Therefore, we do not sustain the examiner's rejection of claims 8 and 29.

We now consider the rejection of claim 30 based on the teachings of Hanyu and Hartmann. This rejection is set forth on pages 3-4 of the answer. Appellants argue that Hartmann does not teach a spatially uniform intermediate state. Appellants also argue that Hanyu does not teach the specific advantages associated with the range of  $10^8$ - $10^{11}$  eqcm. The examiner responds that Hartmann teaches a spatially uniform

intermediate state in Figures 2a-2g and Figure 4. The examiner also responds that the range taught by Hanyu includes the range claimed by appellants. Appellants respond that the multi-domain states of Hartmann are not the same as a spatially uniform intermediate state.

In considering Hartmann, the examiner notes that when  $-6V < V < 0V$ , the liquid crystal display is in a first state (OFF), whereas when  $V \geq 6V$ , the liquid crystal display is in a second state (ON), while when  $V_{b1} < V < 0$ , for example,  $-5V < V_b < 0$ , the liquid crystal display has a spatially uniform intermediate state [answer, pages 11-12]. We do not agree with this interpretation of the examiner. The liquid crystal display of Hartmann has a first stable state (ON) when  $V_d \geq 6V$  and a second stable state (OFF) when  $V_d < 0V$  [note Figure 4b]. The intermediate state identified by the examiner appears to us to simply be part of the range of conditions when the liquid crystal display is in the OFF state. Thus, the conditions identified by the examiner do not result in a spatially uniform intermediate state as claimed, but rather, result in one of the bistable states.

Since Hartmann does not teach a liquid crystal layer

Appeal No. 1999-0578  
Application 08/217,641

which exhibits a spatially uniform intermediate state between bistable states, we do not sustain the examiner's rejection of claim 30, and a discussion of Hanyu is unnecessary. We do note for the record, however, that the range of  $10^5$ - $10^{14}$  eqcm disclosed by Hanyu is not a misprint [note that the range is repeated in claim 5].

In summary, we have sustained the examiner's rejection of claim 1, but we have not sustained the examiner's rejections of claims 2-4, 8, 29 and 30. Therefore, the decision of the examiner rejecting claims 1-4, 8, 29 and 30 is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

JERRY SMITH  
Administrative Patent Judge

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Appeal No. 1999-0578  
Application 08/217,641

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